

CLAIMS

1. A flicker reduction method for reducing a  
fluorescent light flicker component in a video signal or a  
5 luminance signal obtained by photographing a subject through  
an XY addressing type image pickup element under an  
illumination of a fluorescent lamp, comprising:

a step of integrating the video signal or the luminance  
signal, as an input image signal, throughout a duration of  
10 time equal to or longer than one horizontal period,

a step of normalizing the integrated value or a  
difference value between the integrated values of adjacent  
fields or adjacent frames,

a step of extracting a spectrum of the normalized  
15 integrated value or the normalized difference value,

a step of estimating a flicker component from the  
extracted spectrum, and

a step of performing a calculation operation on the  
estimated flicker component and the input image signal to  
20 cancel out the estimated flicker component.

2. A flicker reduction method for reducing a  
fluorescent light flicker component in each of color signals  
of colors obtained by photographing a subject through an XY  
addressing type image pickup element under an illumination  
25 of a fluorescent lamp, comprising:

a step of integrating the color signal of each color,  
as an input image signal, throughout a duration of time  
equal to or longer than one horizontal period,

a step of normalizing the integrated value or a  
5 difference value between the integrated values of adjacent  
fields or adjacent frames,

a step of extracting a spectrum of the normalized  
integrated value or the normalized difference value,

a step of estimating a flicker component from the  
10 extracted spectrum, and

a step of performing a calculation operation on the  
estimated flicker component and the input image signal to  
cancel out the estimated flicker component.

3. A flicker reduction method for reducing a  
15 fluorescent light flicker component in both a luminance  
signal and each of color signals of colors, obtained by  
photographing a subject through an XY addressing type image  
pickup element under an illumination of a fluorescent lamp,  
comprising:

20 a step of integrating each of the luminance signal and  
the color signal of each color, as an input image signal,  
throughout a duration of time equal to or longer than one  
horizontal period,

a step of normalizing the integrated value or a  
25 difference value between the integrated values of adjacent

fields or adjacent frames,

a step of extracting a spectrum of the normalized integrated value or the normalized difference value,

a step of estimating a flicker component from the  
5 extracted spectrum, and

a step of performing a calculation operation on the estimated flicker component and the input image signal to cancel out the estimated flicker component.

4. The flicker reduction method according to one of  
10 claims 1 to 3, wherein the normalizing step comprises dividing the difference value by the average value of the integrated values of a plurality of consecutive fields or consecutive frames.

5. The flicker reduction method according to one of  
15 claims 1 to 3, wherein the normalizing step comprises dividing the difference value by the average value of the integrated values of a plurality of consecutive fields or consecutive frames, and subtracting a predetermined value from the resulting quotient.

20 6. The flicker reduction method according to one of claims 1 to 3, wherein the normalizing step comprises dividing the difference value by the integrated value.

7. The flicker reduction method according to one of claims 1 to 3, wherein the spectrum extracting step  
25 comprises Fourier transforming the normalized integrated

value or the normalized difference value.

8. The flicker reduction method according to one of claims 1 to 3, wherein it is determined whether a level of the input image signal falls within a saturation region, and  
5 if it is determined that the level of the input image signal falls within the saturation region, the input image signal is output as is as an output image signal.

9. The flicker reduction method according to one of claims 1 to 3, wherein it is determined based on a level of  
10 the extracted spectrum whether the input image signal is from under the illumination of the fluorescent lamp, and if it is determined that the input image signal is not from under the illumination of the fluorescent lamp, the input image signal is output as is as an output image signal.

15 10. The flicker reduction method according to one of claims 1 to 3, wherein it is determined whether the subject changes greatly in a short period of time in response to an operation or an action of a photographer, and if it is determined that the subject changes greatly in a short  
20 period of time, one of an immediately precedingly estimated flicker component and a flicker component estimated from an immediately preceding signal, and the input image signal are subjected to a calculation operation.

11. The flicker reduction method according to one of  
25 claims 1 to 3, wherein it is determined whether a

photographing condition requires a flicker reduction operation and if it is determined that the flicker reduction operation is determined to be unnecessary, the input image signal is output as is as an output image signal.

5        12. The flicker reduction method according to one of claims 1 to 3, wherein the estimated flicker component is adjusted and the adjusted flicker component and the input image signal are subjected to the calculation operation.

10        13. The flicker reduction method according to one of claims 1 to 3, wherein amplification data and initial phase data of the estimated flicker component are adjusted through respective low-pass filters, and a flicker component to be subjected to the calculation operation together with the input image signal is generated using the adjusted  
15        amplification data and the adjusted initial phase data.

14. The flicker reduction method according to claim 13, wherein the adjusted amplitude data and the adjusted initial phase data are stored in a memory, and if a predetermined condition is detected, the flicker component to be subjected  
20        to the calculation operation together with the input image signal is generated using the stored amplitude data and the stored initial phase data.

15. An image pickup device comprising:  
an XY addressing type image pickup element,  
25        means for integrating a video signal or a luminance

signal, as an input image signal, throughout a duration of time equal to or longer than one horizontal period, the video signal or the luminance signal being obtained by photographing a subject through the XY addressing type image

5 pickup element,

means for normalizing the integrated value or a difference value between the integrated values of adjacent fields or adjacent frames,

means for extracting a spectrum of the normalized  
10 integrated value or the normalized difference value,

means for estimating a flicker component from the extracted spectrum, and

means for performing a calculation operation on the estimated flicker component and the input image signal to  
15 cancel out the estimated flicker component.

16. An image pickup device comprising:

an XY addressing type image pickup element,

means for integrating a color signal of each color, as an input image signal, throughout a duration of time equal  
20 to or longer than one horizontal period, the color signal being obtained by photographing a subject through the XY addressing type image pickup element,

means for normalizing the integrated value or a difference value between the integrated values of adjacent  
25 fields or adjacent frames,

means for extracting a spectrum of the normalized integrated value or the normalized difference value,

means for estimating a flicker component from the extracted spectrum, and

5 means for performing a calculation operation on the estimated flicker component and the input image signal to cancel out the estimated flicker component.

17. An image pickup device comprising:

an XY addressing type image pickup element,

10 means for integrating each of a luminance signal and a color signal of each color, as an input image signal, throughout a duration of time equal to or longer than one horizontal period, the video signal and the luminance signal being obtained by photographing a subject through the XY  
15 addressing type image pickup element,

means for normalizing the integrated value or a difference value between the integrated values of adjacent fields or adjacent frames,

means for extracting a spectrum of the normalized  
20 integrated value or the normalized difference value,

means for estimating a flicker component from the extracted spectrum, and

means for performing a calculation operation on the estimated flicker component and the input image signal to  
25 cancel out the estimated flicker component.

18. The image pickup device according to one of claims 15 to 17, wherein the normalizing means divides the difference value by the average value of the integrated values of a plurality of consecutive fields or consecutive frames.

19. The image pickup device according to one of claims 15 to 17, wherein the normalizing means divides the difference value by the average value of the integrated values of a plurality of consecutive fields or consecutive frames, and subtracts a predetermined value from the resulting quotient.

20. The image pickup device according to one of claims 15 to 17, wherein the normalizing means divides the difference value by the integrated value.

21. The image pickup device according to one of claims 15 to 17, wherein the spectrum extracting means Fourier transforms the normalized integrated value or the normalized difference value.

22. The image pickup device according to one of claims 15 to 17, comprising means for determining whether a level of the input image signal falls within a saturation region, and outputting the input image signal as is as an output image signal if it is determined that the level of the input image signal falls within the saturation region.

23. The image pickup device according to one of claims

15 to 17, comprising means for determining, based on a level of the spectrum extracted by the spectrum extracting means, whether the input image signal is from under the illumination of the fluorescent lamp, and outputting the input image signal as is as an output image signal if it is determined that the input image signal is not from under the illumination of the fluorescent lamp.

24. The image pickup device according to one of claims 15 to 17, comprising means for determining whether the subject changes greatly in a short period of time in response to an operation or an action of a photographer, and if it is determined that the subject changes greatly in a short period of time, causing the calculating means to subject to the calculation operation, one of a flicker component immediately precedingly estimated by the flicker component estimating means and a flicker component estimated by the flicker component estimating means from an immediately preceding signal, and the input image signal.

25. The image pickup device according to one of claims 15 to 17, comprising means for determining whether a photographing condition requires a flicker reduction operation and if it is determined that the flicker reduction operation is unnecessary, outputting the input image signal as is as an output image signal.

26. The image pickup device according to one of claims

15 to 17, comprising adjusting means for adjusting the  
flicker component estimated by the flicker component  
estimating means and generating the flicker component to be  
subjected to the calculation operation together with the  
5 input image signal.

27. The image pickup device according to one of claims  
15 to 17, comprising low-pass filter means for adjusting  
amplification data and initial phase data of the flicker  
component estimated by the flicker component estimating  
10 means, and generating the flicker component to be subjected  
to the calculation operation together with the input image  
signal.

28. The image pickup device according to claim 27,  
comprising storage means for storing the amplitude data and  
15 the initial phase data, adjusted by the low-pass filter  
means, and

means for generating the flicker component to be  
subjected to the calculation operation together with the  
input image signal using the stored amplitude data and the  
20 stored initial phase data if a predetermined condition is  
detected.

29. A flicker reduction circuit for reducing a  
fluorescent light flicker component in a video signal or a  
luminance signal obtained by photographing a subject through  
25 an XY addressing type image pickup element under an

illumination of a fluorescent lamp, comprising:

means for integrating the video signal or the luminance signal, as an input image signal, throughout a duration of time equal to or longer than one horizontal period,

5 means for normalizing the integrated value or a difference value between the integrated values of adjacent fields or adjacent frames,

means for extracting a spectrum of the normalized integrated value or the normalized difference value,

10 means for estimating a flicker component from the extracted spectrum, and

means for performing a calculation operation on the estimated flicker component and the input image signal to cancel out the estimated flicker component.

15 30. A flicker reduction circuit for reducing a fluorescent light flicker component in each of color signals of colors obtained by photographing a subject through an XY addressing type image pickup element under an illumination of a fluorescent lamp, comprising:

20 means for integrating the color signal of each color, as an input image signal, throughout a duration of time equal to or longer than one horizontal period,

means for normalizing the integrated value or a difference value between the integrated values of adjacent  
25 fields or adjacent frames,

means for extracting a spectrum of the normalized integrated value or the normalized difference value,

means for estimating a flicker component from the extracted spectrum, and

5 means for performing a calculation operation on the estimated flicker component and the input image signal to cancel out the estimated flicker component.

31. A flicker reduction circuit for reducing a fluorescent light flicker component in each of a luminance  
10 signal and each of color signals of colors, obtained by photographing a subject through an XY addressing type image pickup element under an illumination of a fluorescent lamp, comprising:

means for integrating each of the luminance signal and  
15 the color signal of each color, as an input image signal, throughout a duration of time equal to or longer than one horizontal period,

means for normalizing the integrated value or a difference value between the integrated values of adjacent  
20 fields or adjacent frames,

means for extracting a spectrum of the normalized integrated value or the normalized difference value,

means for estimating a flicker component from the extracted spectrum, and

25 means for performing a calculation operation on the

estimated flicker component and the input image signal to cancel out the estimated flicker component.

32. The flicker reduction circuit according to one of claims 29 to 31, wherein the normalizing means divides the  
5 difference value by the average value of the integrated values of a plurality of consecutive fields or consecutive frames.

33. The flicker reduction circuit according to one of claims 29 to 31, wherein the normalizing means divides the  
10 difference value by the average value of the integrated values of a plurality of consecutive fields or consecutive frames, and subtracts a predetermined value from the resulting quotient.

34. The flicker reduction circuit according to one of  
15 claims 29 to 31, wherein the normalizing means divides the difference value by the integrated value.

35. The flicker reduction circuit according to one of claims 29 to 31, wherein the spectrum extracting means  
Fourier transforms the normalized integrated value or the  
20 normalized difference value.

36. The flicker reduction circuit according to one of claims 29 to 31, comprising means for determining whether a level of the input image signal falls within a saturation region, and outputting the input image signal as is as an  
25 output image signal if it is determined that the level of

the input image signal falls within the saturation region.

37. The flicker reduction circuit according to one of claims 29 to 31, comprising means for determining, based on a level of the spectrum extracted by the spectrum extracting means, whether the input image signal is from under the illumination of the fluorescent lamp, and outputting the input image signal as is as an output image signal if it is determined that the input image signal is not from under the illumination of the fluorescent lamp.

38. The flicker reduction circuit according to one of claims 29 to 31, comprising means, under the control of external means, for causing the calculating means to perform the calculation operation on one of the flicker component immediately precedingly estimated by the flicker component estimating means and the flicker component estimated by the flicker component estimating means based on an immediately prior signal, and the input image signal.

39. The flicker reduction circuit according to one of claims 29 to 31, comprising means for outputting the input image signal as is as an output image signal under the control of external means.

40. The flicker reduction circuit according to one of claims 29 to 31, comprising means for performing the calculation operation on the flicker component, estimated by the flicker component estimating means and adjusted by the

external means, and the input image signal.